

# PortMaster Communications Server



**Hardware  
Installation Guide**

**Livingston**  
Enterprises, Inc.



# *Communications Server Hardware Installation Guide*

PM-2, PM-2E, PM-2ER, PM-2R, PM-25, PM-2i-U,  
PM-2i-ST, PM-2E-10I-U, PM-2E-10I-ST

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- 91/263/EEC (Telecommunications Terminal Equipment)
- 73/23/EEC (Low Voltage Directive)
- 89/336/EEC (ElectroMagnetic Compatibility) as amended by 92/31/EEC

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- French delta requirements CSE P 10-21 A
- German delta requirements BAPT 223 ZV 25

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# *Preface*

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## *About this Guide*

This guide provides complete hardware installation instructions for the PortMaster™ Communications Server.

For information about PortMaster software, see page 1-5.

## *Audience*

This guide is designed to be used by qualified system administrators and network managers. Knowledge of basic networking concepts is required to successfully install your PortMaster.

## *Preview of this Guide*

This guide includes the following chapters:

**Chapter 1, "Overview"** introduces the PortMaster.

**Chapter 2, "Preparing for Installation"** provides pre-installation safety and device requirements and describes required tools and equipment.

**Chapter 3, "Installing the PortMaster"** provides step-by-step physical, electrical, and online installation instructions.

**Chapter 4, "Troubleshooting the Hardware Installation"** discusses some potential installation difficulties and suggests remedies for these problems.

The appendices provide cabling specifications, electrical and physical specifications, and tips for ordering ISDN service.

## Document Conventions

The following table describes the type changes and symbols used in this guide.

Typeface or Symbol	Meaning	Example
<i>AaBbCc123</i>	The names of commands, parameters, and directories; on-screen computer output.	Use <i>version</i> to display the version number.
<b>AaBbCc123</b>	What you type, contrasted with on-screen computer output.	login: <b>!root</b> Password:
<i>AaBbCc123</i>	Command-line placeholder; replace with a real name or value.	To set baud rate, type: <b>set s0 speed 2 baud_rate</b>
<b>[AaBbCc123]</b>	A key to press on the keyboard.	login: <b>!root [Enter]</b>

## *Contacting Livingston Technical Support*

Every Livingston product comes with a one year hardware warranty.

To obtain technical support, contact Livingston Monday through Friday between the hours of 6 a.m. and 5 p.m. (GMT -8) Please record your ComOS version number and report it to the technical support staff.

- By voice, dial (800) 458-9966 within the USA or +1 (510) 426-0770 from outside the USA
- By FAX, dial +1 (510) 426-8951
- By electronic mail, send mail to [support@livingston.com](mailto:support@livingston.com)
- Using the World Wide Web, see <http://www.livingston.com/>

One-hour installation appointments may be scheduled in advance by calling the technical support phone number listed above.

New releases and upgrades of Livingston software are available via anonymous FTP from <ftp.livingston.com>.

Livingston maintains the following Internet mailing lists for PortMaster users:

- `portmaster-users`

A discussion of general and specific PortMaster issues, including configuration and troubleshooting suggestions. To subscribe, send electronic mail to [majordomo@livingston.com](mailto:majordomo@livingston.com). Type `subscribe portmaster-users` in the body of the message.

The mailing list is also available in a daily digest format. To receive the digest, send electronic mail to [majordomo@livingston.com](mailto:majordomo@livingston.com) with `subscribe portmaster-users-digest` in the body of the message.

- `portmaster-announce`

Announcements of new PortMaster products and software releases. To subscribe, send electronic mail to [majordomo@livingston.com](mailto:majordomo@livingston.com) with `subscribe portmaster-announce` in the body of the message.





The PortMaster Communications Server is a high-speed network access server designed to operate in a multi-protocol network environment. It provides shared network access to printers, modems and other attached peripherals, as well as access to terminals, X terminals, and remote users using dial-up networking.

## ***PortMaster Product Line***

The product line includes the following models:

*Table 1-1* PortMaster Communications Servers

Model	Description
PM-2	Offers 10 asynchronous ports. Permits access to parallel devices (such as printers) via a parallel port.
PM-2E	An expandable server. Up to two expansion boards may be added for a total of up to 30 asynchronous ports or 10 asynchronous ports and 10 BRI ports. Expansion boards are described in Table 1-2 on page 1-2.
PM-2ER PM-2R	<p>The PM-2ER is an expandable server. Up to two expansion boards may be added for a total of up to 20 asynchronous ports or 10 asynchronous ports and 5 BRI ports.</p> <p>The PM-2ER and PM-2R may be used to extend networks over long distances at up to T1/E1 speeds using leased lines, Frame Relay, ISDN, or switched 56K circuits. Includes a synchronous port that can be configured for RS-232 or V.35 signalling to provide WAN connectivity at speeds up to T1 or E1 (2.048 Mbps).</p>
PM-25	Offers 25 asynchronous ports, consisting of one console port and 3 high-density 68-pin connectors, each of which support 8 asynchronous serial devices.

Table 1-1 PortMaster Communications Servers (Continued)

Model	Description
PM-2i-U PM-2i-ST	ISDN models. These servers each have 5 BRI channels providing, respectively, either a U interface with integrated NT1, or an S/T interface requiring an external NT1.
PM-2E-10I-U PM-2E-10I-ST	Expandable ISDN models. These servers each have room for up to two expansion boards (5 BRI ports each), for a total of up to 15 BRI ports (30 B channels).

The following expansion boards are available for the expandable servers:

Table 1-2 Expansion Boards

Expansion Board	Description
MOD-2E	Offers 10 asynchronous ports. Two models are available: MOD-2E-10A (ports S10-S19), and MOD-2E-10B (ports S20-S29).
MOD-10I-U	<p>Offers 5 BRI ports (10 B channels). It also provides one high-density 10-pin RJ-45 connector supporting all five BRIs in one cable. This board provides a U interface with integrated NT1 that attaches directly to the ISDN line; an external NT1 is not necessary. U interface products are intended for use in the United States and Canada.</p> <p>Revisions A and B of the MOD-10I-U board may only be used in the PortMaster 2E. Revision C boards may be used in any expandable PortMaster.</p>
MOD-10I-ST	Offers 5 BRI ports (10 B channels). This board provides an S/T interface for countries that follow international ISDN standards.



The PortMaster front panel is displayed below. The product name displayed on the panel below applies to the PM-2; this will be different for each unit.

Figure 1-1 PortMaster Communications Server Front Panel



Table 1-3 shows the available ports on each PortMaster model. Table 1-4 on page 1-4 shows how to upgrade your PortMaster. Physical specifications are listed in Appendix B.

Table 1-3 Available Port Types by PortMaster Model

Product	Ports					
	Ethernet	Asynchronous	Synchronous	Parallel	BRI U	BRI S/T
PM-2	ether0	s0-9		p0		
PM-2E-10	ether0	s0-9		p0		
PM-2E-20	ether0	s0-19*		p0	s10-19*	s10-19*
PM-2E-30	ether0	s0-29*		p0	s10-29*	s10-29*
PM-2ER-10	ether0	s0-9	w1			
PM-2ER-20	ether0	s0-19*	w1		s10-19*	s10-19*
PM-2ER-30	ether0	s0-29*	w1		s10-29*	s10-29*
PM-2R	ether0	s0-9	w1			
PM-25	ether0	s0-24 <sup>†</sup>				
PM-2i-U	ether0	c0			s0-9	
PM-2i-ST	ether0	c0				s0-9

Table 1-3 Available Port Types by PortMaster Model (Continued)

Product	Ports				
	Ethernet	Asynchronous	Synchronous	Parallel	BRI U      BRI S/T
PM-2E-10I-U	ether0	c0			s0-29*
PM-2E-10I-ST	ether0	c0			s0-29*

\* Ports s10-19 are ISDN B channels if a MOD-10I-U or MOD-10I-ST board is placed in the first expansion slot. Ports s20-29 are ISDN B channels if a MOD-10I-U or MOD-10I-ST board is placed in the second expansion slot.

† A single asynchronous serial port (S0) is provided, as well as three high-density 68-pin connectors, each of which support eight asynchronous serial devices.

Table 1-4 PortMaster Upgrades

Model	May Be Upgraded to Model	By Installing
PM-2E-10	PM-2E-20	1 MOD-2E-10A
PM-2E-20	PM-2E-30	1 MOD-2E-10B
PM-2E-10	PM-2E-10 with 5 or 10 BRI U ports	1 or 2 MOD-10I-U
PM-2E-10	PM-2E-10 with 5 or 10 BRI S/T ports	1 or 2 MOD-10I-ST
PM-2ER-10	PM-2ER-10 with 5 or 10 BRI U ports	1 or 2 MOD-10I-U (Revision C or later)
PM-2ER-10	PM-2ER-10 with 5 or 10 BRI S/T ports	1 or 2 MOD-10I-ST
PM-2ER-10	PM-2ER-20	1 MOD-2E-10A
PM-2ER-20	PM-2ER-30	1 MOD-2E-10B
PM-2ER-20	PM-2ER-20 with 5 BRI U ports	1 MOD-10I-U (Revision C or later)
PM-2ER-20	PM-2ER-20 with 5 BRI S/T ports	1 MOD-10I-ST
PM-2E-10I-U	PM-2E-10I-U with 10 or 15 BRI U ports	1 or 2 MOD-10I-U
PM-2E-10I-ST	PM-2E-10I-ST with 10 or 15 BRI S/T ports	1 or 2 MOD-10I-ST

## PortMaster Software

Every PortMaster product comes with the ComOS operating system software installed in non-volatile Flash RAM. This software is periodically updated; new releases are announced on the PortMaster mailing lists (see page xi) and are available via anonymous FTP from <ftp.livingston.com>.

ComOS version 3.3.1 or later is recommended for all PortMaster models. The following table lists the earliest ComOS version that may be used with each PortMaster.

Table 1-5 PortMaster Software

Product	Earliest Compatible ComOS Release
PM-2	Any ComOS release may be used
PM-2E	Any ComOS release may be used
PM-2ER	ComOS 3.1
PM-2R	ComOS 3.1
PM-25	ComOS 3.1.4
PM-2i-U	ComOS 3.3.1
PM-2i-ST	ComOS 3.3.2
PM-2E-10I-U	ComOS 3.3.1
PM-2E-10I-ST	ComOS 3.3.2
MOD-2E	Any ComOS release may be used
MOD-10I-U	ComOS 3.3.1
MOD-10I-ST	ComOS 3.3.2

Livingston's PMconsole software may be used to configure the PortMaster. PMconsole guides you through configuration using a simple graphical interface. It is available for Windows™ (Windows 3.1, 3.11 and Windows for Workgroups 3.11) and for many versions of UNIX.



To configure the PortMaster using PMconsole for Windows, see the *PMconsole for Windows Administrator's Guide*. A *PMconsole for UNIX Administrator's Guide* is expected to be released shortly.

The PortMaster may also be configured without PMconsole using a command line interface. Configuring the PortMaster in this manner is described in the *Configuration Guide for PortMaster Products*. This manual provides in-depth coverage of configuration issues (including command syntax), as well as an overview of networking issues related to the PortMaster products.

To install the PortMaster software, see the instructions on the *Total Access CD*.

This chapter includes the following topics: safety recommendations, general site requirements, cable requirements, power guidelines, and equipment requirements.

## *Safety Recommendations*

This section covers safety suggestions for everyday PortMaster use and for expansion board installation and removal.

### *General PortMaster Use*

When using the PortMaster, always follow these safety guidelines:

- Keep the chassis area clean and dust-free during and after installation.
- Disconnect all power before doing the following:
  - Changing the Ethernet connection
  - Removing the cover
  - Working near power supplies
  - Changing a fuse
  - Installing or removing an expansion board
- Never assume power is disconnected from a circuit. Always check.
- Before applying power:
  - Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, or missing safety grounds.
  - Locate the emergency power switch for the room in which you are working.



**Warning** – The PortMaster contains no user-serviceable parts. The chassis should never be opened except when adding or removing RAM or expansion boards (see the following section).

## *Adding and Removing RAM and Expansion Boards*

When adding or removing RAM or expansion boards, please note the following:

- If you need to open the PortMaster case, make sure that you are not wearing loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses when working under any conditions that might be hazardous to your eyes.
- Keep tools away from walk areas where you and others could fall over them.
- Before working on the system, unplug the power cord.
- Do not work alone if potentially hazardous conditions exist.



**Caution** – If the internal components of the PortMaster are handled, electrostatic discharge can occur, resulting in damage to its circuitry and followed by complete or intermittent failures. Use an anti-static strap when installing or removing expansion boards.



**Warning** – Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.

If an electrical accident occurs, proceed as follows:

1. Locate the emergency power switch for the room in which you are working and turn the power OFF.
2. Cautiously unplug the system's power.
3. If possible, send another person to get medical aid; otherwise, assess the condition of the victim and then call for help.
4. Determine if the person needs rescue breathing or external cardiac compression, then take appropriate action.



## ***Site Requirements***

This section describes the requirements your site must meet for safe installation and operation of the PortMaster. Prepare your site properly before beginning installation.

### ***Environment***

Choose a clean, dust-free and (preferably) air conditioned location. Avoid direct sunlight, proximity to heat sources, and areas with high levels of electromagnetic interference (EMI).

### ***Chassis Accessibility***

Leave at least three inches (8 cm) clearance at the rear of the PortMaster for cabling.

### ***Cooling and Airflow***

To prevent overheating, the operating environment for the PortMaster should not exceed 113°F (45°C). For proper airflow, allow at least three inches (8 cm) clearance around all vent openings.

## ***Power Guidelines***

Before applying power, read the following power guidelines.

- Inspect the PortMaster to verify that cables are installed correctly, ventilation is adequate, and power is coming from a building branch circuit.
- Before you connect to a power source, verify that the source is properly grounded and falls within the internal power supply rating. The PortMaster operates correctly at any AC voltage from 100V to 260V and frequencies from 50 to 60 Hz.

## ***Required Tools and Equipment***

The PortMaster has no internal user-serviceable parts. It is possible, however, to change the fuse and add RAM and expansion boards.

A 3/16" flat-blade screwdriver is required to change the fuse, and a Phillips screwdriver is required for adding expansion boards. The same Phillips screwdriver can be used for rack installation.

Before changing the fuse, adding memory, or installing expansion boards, see the following sections:

- "Fuse", page 3-17
- "Installing PortMaster Expansion Boards", page 3-21
- "Removing PortMaster Expansion Boards", page 3-24
- "Adding Memory", page 3-26



**Caution** – Before you install the PortMaster, read Chapter 2, “Preparing for Installation.”

This chapter includes the following installation topics: desktop installation, rack-mount installation, overview of LEDs, overview of connectors and DIP switches, connecting to the network and console, configuring the PortMaster, adding or removing expansion cards, and memory issues.

## Desktop Installation

For desktop installation, place the PortMaster on a flat secure surface. Your location should provide a clearance of three inches (8 cm) for cabling and airflow.

## Rack-mounting

To rack-mount your PortMaster, refer to the following table.

*Table 3-1* Rack-mounting Instructions

Model	Rack-mounting Kit and Instructions
PM-2i-U PM-2i-ST PM-2E-10I-U PM-2E-10I-ST PM-25	A “rack ears” rack-mounting kit is shipped with the PortMaster. The kit includes rack-mounting brackets and screws. To assemble the rack mount, see page 3-2.
PM-2 PM-2E PM-2ER PM-2R	A rack-mounting kit must be ordered from Livingston Enterprises; use ordering code “RACK-1”. To assemble the rack mount, see page 3-3.



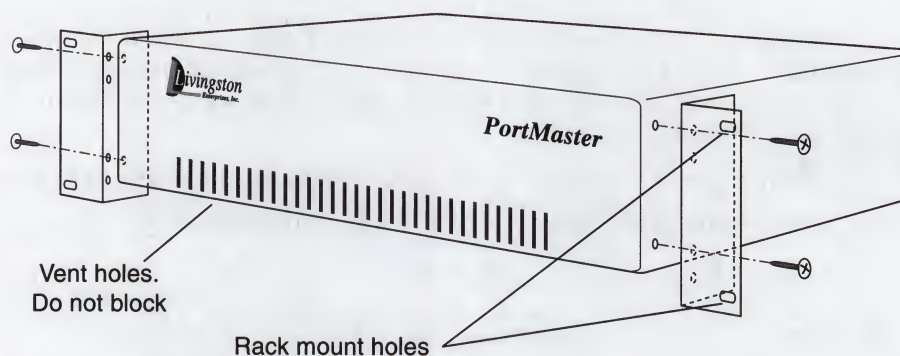
## Rack Ears Rack-mount Installation

The “rack ears” rack-mount kit includes two angle brackets and eight 12-24 screws. To rack-mount your PortMaster using this kit, complete the following steps. A Phillips and a flathead screwdriver are required.

1. Remove any plastic plugs that may be in the mounting holes in the chassis by inserting a thin-blade screwdriver under the plug edge and lifting.
2. Mount the angle brackets to the sides of the PortMaster using four 12-24 screws, so that the top edge of the angle bracket is aligned with the top of the PortMaster. See Figure 3-1.

The angle bracket will extend 1/2 inch (13 mm) below the bottom of the chassis.

Figure 3-1 Mounting the Angle Brackets



3. Attach the PortMaster to a rack with universal E.I.A. spacing, using the oblong holes on the front of each angle bracket.

The rack-mounted PortMaster occupies the space allotted to a standard 3.5 inch (8.9 cm) or 7 inch (17.8 cm) panel.

## ***RACK-1 Rack-mount Installation***

The RACK-1 rack-mount kit includes four 12-24x1/2" pan head screws and four #4x3/4" sheet metal screws. To rack-mount a PortMaster using this kit, complete the following steps:

- 1. Lay the PortMaster upside down on a protected table surface, with the front of the PortMaster approximately 1/4" over the front edge of the table.**
- 2. Unscrew (counter-clockwise) the black plastic screws that secure the feet to the bottom of the PortMaster.**

Retain the feet and the center expansion sleeve in each foot in place on the bottom of the PortMaster.

- 3. Turn the rack mount unit upside down and align its four holes with the centers of the holes in the PortMaster feet.**

The front of the PortMaster case sits about 1/8" in front of the mounting shelf flanges.

- 4. Press (do not screw) each of the #4x3/4" sheet metal screws into the four mounting shelf holes.**
- 5. Turn the unit right side up by lifting from the front and rear of the PortMaster.**
- 6. Install the unit in the rack with the four 12-24x1/2" pan head screws.**

## ***Connectors and DIP Switches***

The section gives an overview of all PortMaster ports and DIP switches.



**Note** – For cabling specifications and ordering instructions, refer to Appendix A, “Cabling Specifications.”

### ***Asynchronous Ports***

Each asynchronous port has a 25-pin D-type female connector, providing RS-232 signalling under the enhanced RS-423 standard. On each PortMaster, one asynchronous port has been designated the console port. On ISDN models, this is port C0; on all other models, the console port is S0.

To connect Data Communication Equipment (DCE) asynchronous devices (such as modems) to the PortMaster, connect a standard male straight-through RS-232 cable to any asynchronous port. To connect to a Data Terminal Equipment (DTE) device such as a terminal, use a null modem cable, typically male-to-female.



**Note** – To display diagnostic messages on a terminal connected to the console port, set DIP switch #1 UP, and set the console to 9600 baud, 8 data bits, 1 stop bit, no parity, and XON/XOFF software flow control. When DIP switch #1 is DOWN, port S0/C0 operates in the same manner as any other asynchronous port.

### ***High-Density 68-pin Asynchronous Port***

The PM-25 has three high-density 68-pin connectors.

To connect eight separate modems to these connectors, use a 4 foot (120 cm) cable that splits into eight DB-25 straight-through cables. To connect to a US Robotics quad modem rack, use a 3 foot (90 cm) cable that splits into two 50-pin high-density connectors.



## *Synchronous Port*

A synchronous port (W1) capable of speeds up to T1/E1 is available on the PM-2R and PM-2ER. This port has a switch to determine the port's signalling:

- To use an RS-232 cable, set the W1 port switch to UP.
- To use a V.35, RS-530, or X.21 cable, set the W1 port switch to DOWN.

W1 requires an external clock signal. This signal is usually provided by the telephone company, but may also be provided by a CSU/DSU.



**Caution** – The synchronous W1 port does not function as an asynchronous port. Do not attempt to connect an asynchronous device to this port.

## *Parallel Port*

A parallel port (P0) is available on the PM-2 and PM-2E. To connect a Centronics-compatible parallel device to this port, use a standard Centronics cable, available at any computer store. Connect the 25-pin male DB-25 connector to the PortMaster and the 36-pin Centronics connector to the parallel device.

## *ISDN BRI Ports*

Five female RJ-45 BRI connectors are provided on the PM-2i-U, PM-2i-ST, PM-2E-10I-U, and PM-2E-10I-ST, and other PortMaster products with installed MOD-10I-U or MOD-10I-ST expansion boards. Each BRI interface corresponds to two ports, counting S0-S9, S10-S19, or S20-S29.

Each BRI port supports two 64K B channels and one D channel for signalling.

The PortMaster ISDN products are divided into two categories: ISDN U models, which provide a U interface for use in countries that follow North American telephone standards, and ISDN S/T models, which provide an S/T interface in countries that follow international ISDN standards.

### *ISDN S/T Products*

ISDN S/T PortMasters and expansion boards require an RJ-45 cable for each ISDN S/T BRI. 5 RJ-45 cables are shipped with each unit. Pins 3-6 of the cable are used to carry signalling for two B channels and one D channel.

### *ISDN U Products*

ISDN U PortMasters and expansion boards require an RJ-45 cable for an ISDN U BRI with integrated NT1. The middle two pins (pins 4 and 5) of the cable are used to carry signalling for two B channels and one D channel.

### *High-Density 10-pin ISDN U BRI Port*

ISDN U models have a high-density 10-pin RJ-45 port, labelled HD, which supports all five BRI's on 10 wires. (Expandable PortMasters may have up to 3 HD ports if expansion boards are installed.) Livingston provides a 20-foot cable with RJ-45 at one end and 10 loose wires at the other end to connect this port directly to a punchdown block.

You can use either the five BRI RJ-45 ports or the corresponding pins on the high-density port, but not both. On the expandable PortMasters, this applies to each panel; either the HD port on that panel or the five BRI RJ-45 ports on that panel may be used.

### *Ethernet 10BaseT Port*

The Ethernet 10BaseT port accepts a modular RJ-45 connector. 10BaseT requires a minimum Category 3 twisted pair cable, as specified by the EIA/TIA-568-B wiring standard.

In order to connect to a 10BaseT network, DIP switches #4 and #5 must be set to the UP position.

### *Ethernet AUI Port*

The Ethernet AUI port accepts a standard AUI cable with a DB-15 female connector, or a standard AUI Ethernet transceiver. In order to connect to a transceiver, DIP switch #4 must be DOWN and DIP switch #5 must be UP.



## Ethernet BNC Port

The Ethernet BNC port accepts a standard 10Base2 (thin Ethernet) coaxial cable, which should be terminated at both ends. A BNC T-adapter is shipped with the PortMaster; this adapter should be used to connect the Ethernet cable to the PortMaster.

To use the BNC port for Ethernet connections, DIP switches #4 and #5 must be set to the DOWN position.

## LEDs

Figure 3-2 shows the back-panel of the PM-2, with pointers to system, link and network LEDs, as described in Table 3-2 on page 3-8. These LEDs are located in the same place on all models.

In addition to the three standard PortMaster LEDs, all ISDN models have a status LED adjacent to each BRI port. ISDN U models have an additional status LED for each high-density port (Figure 3-3).

Figure 3-2 PM-2 LEDs

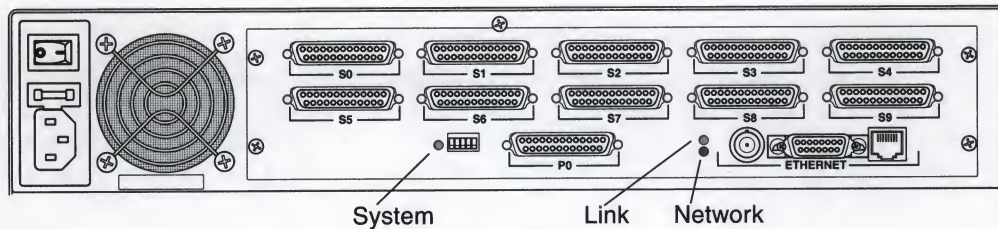




Figure 3-3 Additional BRI Status LED on ISDN Models

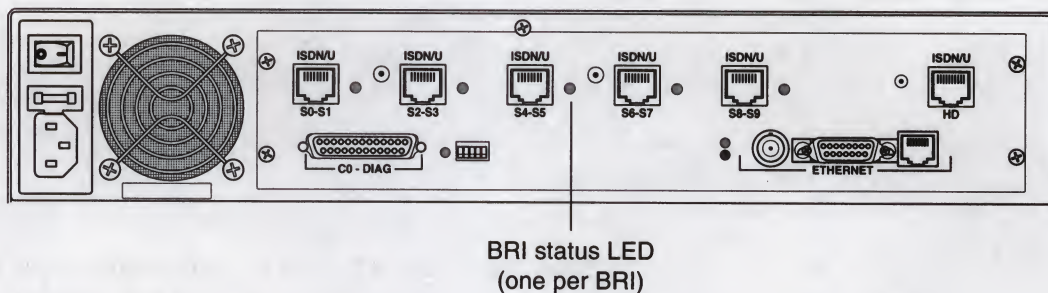


Table 3-2 LED Descriptions

LED	Description
System	<p>This LED (adjacent to the five-section DIP switch) provides three types of diagnostic information:</p> <ul style="list-style-type: none"> <li>• During initial hardware self-test, the LED blinks three times per second.</li> <li>• After the power-on self-test is successfully completed, and while the operating system is loading, the LED blinks at one-second intervals.</li> <li>• When the system is fully operational, the LED remains on for about ten seconds, then blinks once every five seconds.</li> </ul>
Link	<p>This LED (the top of two LEDs adjacent to the Ethernet port) is on when the system has link integrity to a 10BaseT hub. It is only on when a 10BaseT connection exists.</p>
Network	<p>This LED (the bottom of two LEDs adjacent to the Ethernet port) blinks to indicate Ethernet traffic. During heavy traffic, this light may appear solid, due to its rapid blinking.</p>

Table 3-2 LED Descriptions (Continued)

LED	Description
ISDN U	<p>These LEDs are located to the right of each ISDN U port. When power is turned on, each LED blinks eight times per second for approximately one second while performing an internal self-test of the NT1.</p> <p>After the self-test, one of three situations can occur:</p> <ol style="list-style-type: none"> <li>1) If there is a valid SPID and a circuit to the telephone company, the LED blinks once per second while synchronizing with the telephone company, then becomes solidly lit.</li> <li>2) If a SPID is not set on the port but there is a circuit to the telephone company, the LED will blink once per second.</li> <li>3) If there is no SPID set on the port and no circuit, the LED turns off.</li> </ol>
ISDN S/T	<p>These LEDs are located to the right of each ISDN S/T port. When power is turned on, each LED blinks two times per second for approximately ten seconds while the unit is performing a self-test. If the BRI synchronizes with the attached NT1 and switch, the LED turns solid green.</p> <p>If a synchronization failure occurs, the LED turns off. In this case, one of two situations can occur:</p> <ol style="list-style-type: none"> <li>1) If a directory number is set on the port, the LED blinks once every five seconds as the PortMaster attempts to activate the BRI. If the NT1 and the PortMaster are connected with a cable or the switch attempts to activate the BRI, the LED will light. If the PortMaster detects that the BRI has been inactivated, the LED will turn off again.</li> <li>2) If a directory number is not set on the port, the LED remains off.</li> </ol>



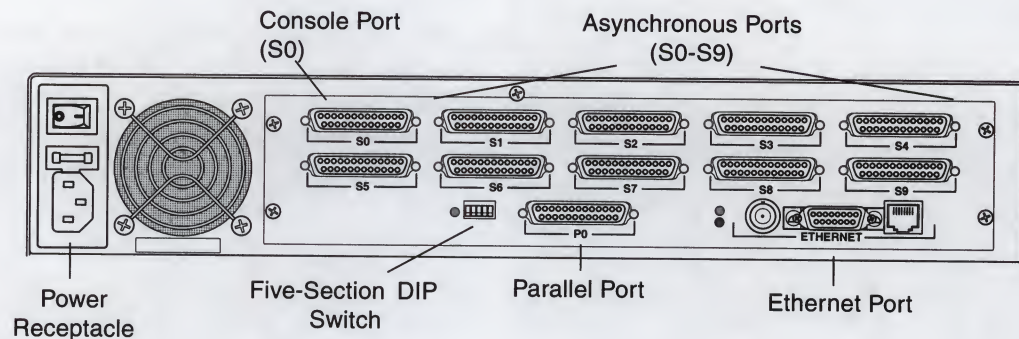
## Rear Panel Overview

The rear panel of the PortMaster provides (left to right and top to bottom):

- A power switch, user-serviceable fuse, and AC power receptacle.
- A five-section DIP switch.
- An asynchronous console port. The console port is C0 on the PM-2i-U, PM-2i-ST, PM-2E-10I-U and PM-2E-10I-ST models. On all other models, the console port is S0.
- Multiple communications ports. These ports consist of up to 30 asynchronous ports, 15 ISDN BRI ports, or three 68-pin high-density connectors that each connect to eight asynchronous devices through a cable adapter. For a complete listing of port availability for each PortMaster, see Table 1-3 on page 1-3.
- A parallel port (P0) on the PM-2 and PM-2E.
- A synchronous serial port (W1) on the PM-2R and PM-2ER. This port has a switch to toggle between RS-232 and V.35 signalling.
- An Ethernet port (ether0) with connectors for 10BaseT, AUI or BNC cabling.

The PM-2 offers 10 asynchronous ports (including a console port), one parallel port, and three Ethernet connectors, one of which may be used.

Figure 3-4 PM-2 Rear Panel





The PM-2R offers the same ports as the PM-2, with the exception of the parallel port. This model replaces the parallel port with a synchronous serial port (W1).

Figure 3-5 PM-2R Rear Panel

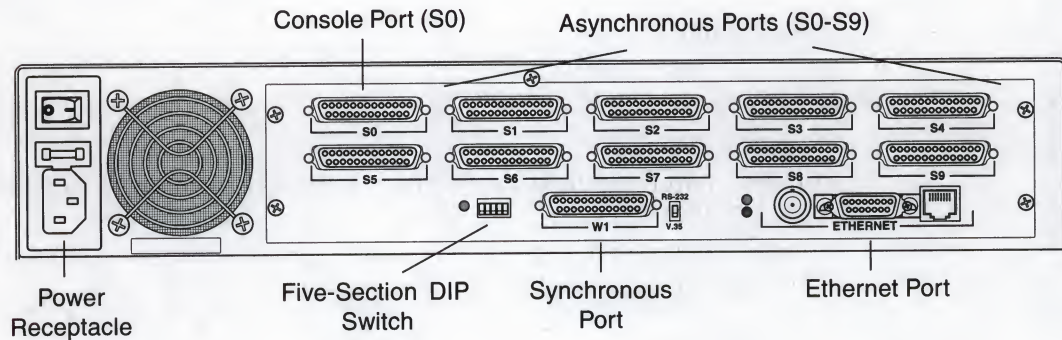
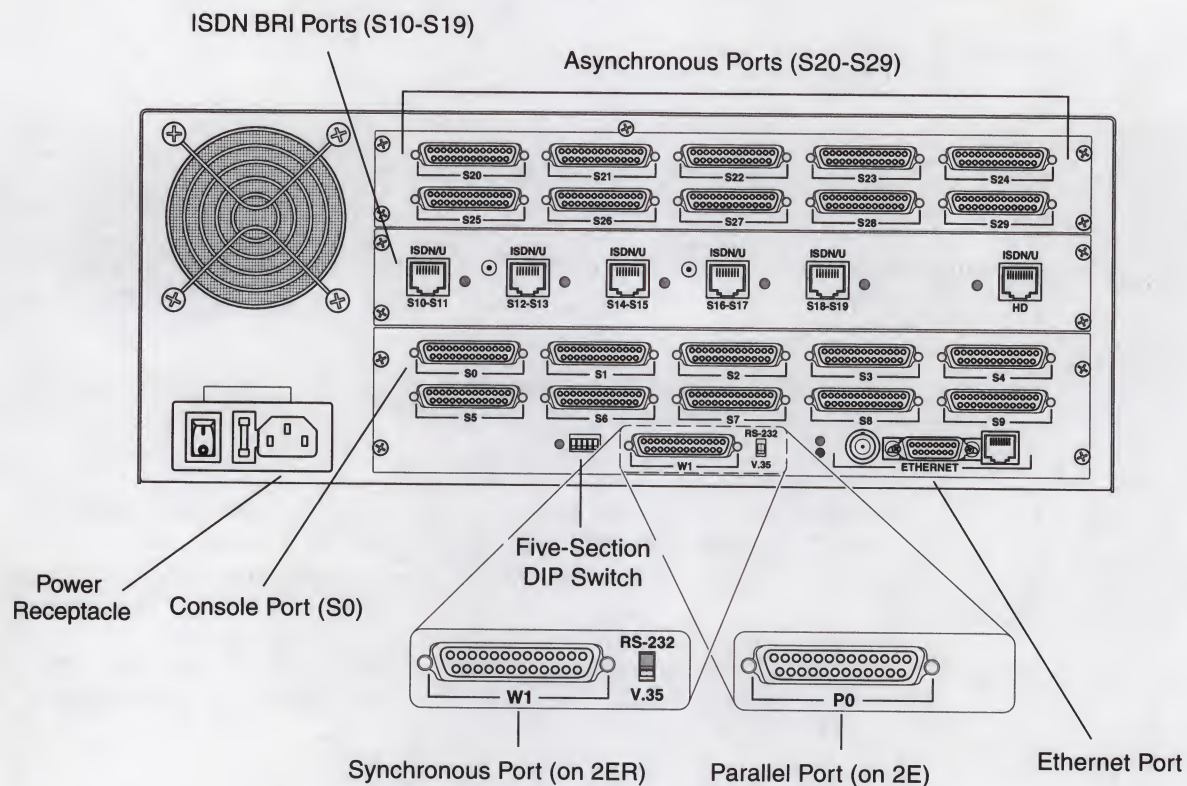


Figure 3-6 on page 3-12 displays the PM-2E and PM-2ER rear panel with expansion slots filled. Ports S10-S19 are ISDN BRI U ports (provided by expansion board MOD-10I-U) and ports S20-S29 are asynchronous ports (provided by expansion board MOD-2E-10B).

The PM-2E and PM-2ER are identical in all respects, with the exception of the lower middle port. This port is a parallel port (P0) on the PM-2E and a synchronous port (W1) on the PM-2ER.

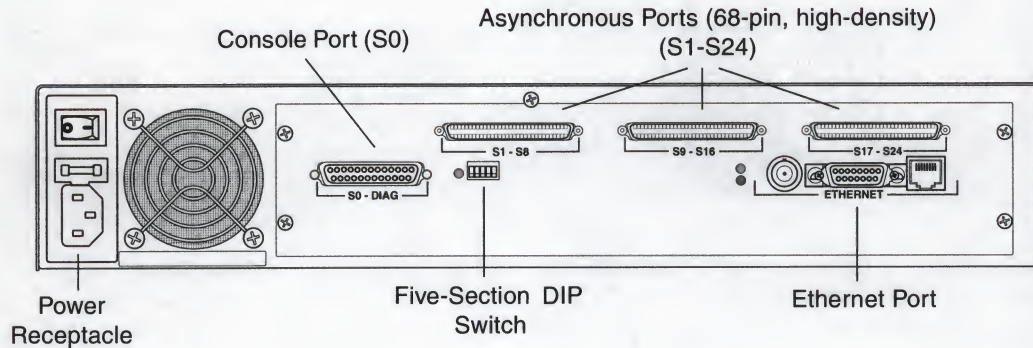
Figure 3-6 PM-2E and PM-2ER Rear Panel with MOD-10I-U and MOD-2E-10B Boards





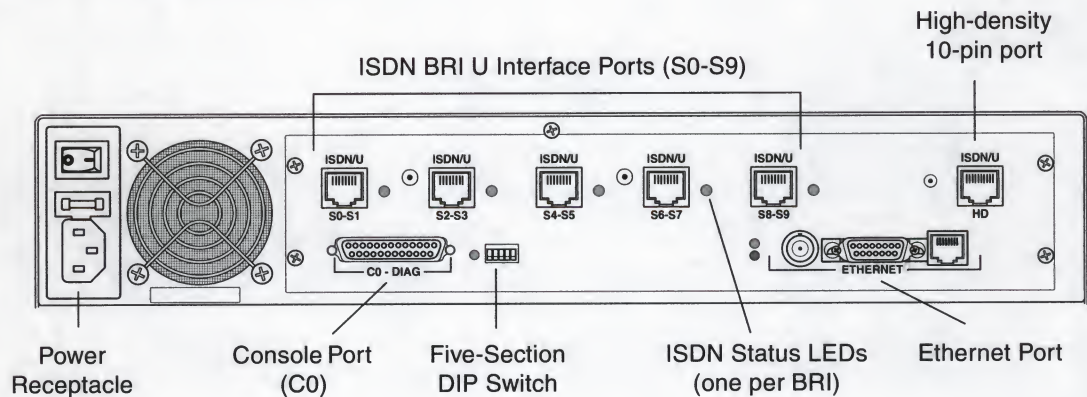
The PM-25 offers 25 asynchronous ports, consisting of one console port and three high-density 68-pin interfaces. Each 68-pin interface supports eight asynchronous connections; for more information, see "High-Density 68-pin Asynchronous Port" on page 3-4 or page A-3.

Figure 3-7 PM-25 Rear Panel



The PM-2i-U offers 5 BRI U ports (10 B channels) with integrated NT1. For a detailed description of these ports, see "ISDN BRI Ports" on page 3-5.

Figure 3-8 PM-2i-U Rear Panel





The PM-2i-ST offers 5 BRI S/T ports (10 B channels) that require external NT1. These ports are described in detail in "ISDN BRI Ports" on page 3-5.

Figure 3-9 PM-2i-ST Rear Panel

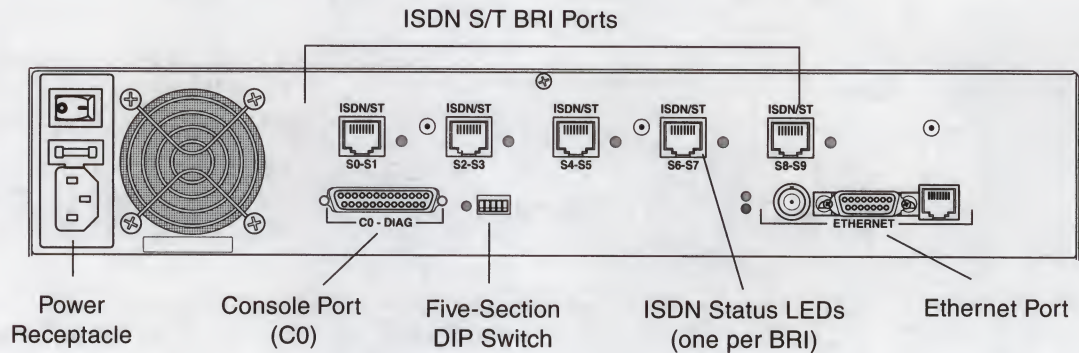
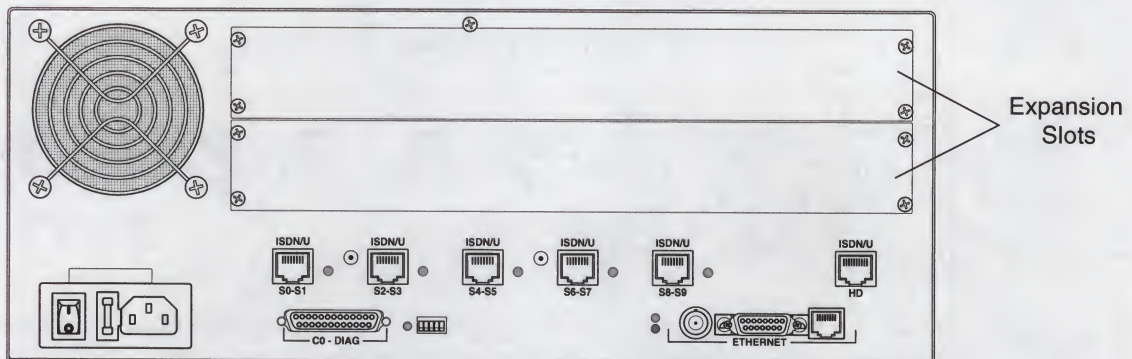


Figure 3-6 shows the PM-2E-10I-U rear panel with empty expansion slots. The PM-2E-10I-ST is physically the same, with two exceptions: the PM-2E-10I-ST does not have an HD port, and the ISDN U ports are replaced with ISDN S/T ports.

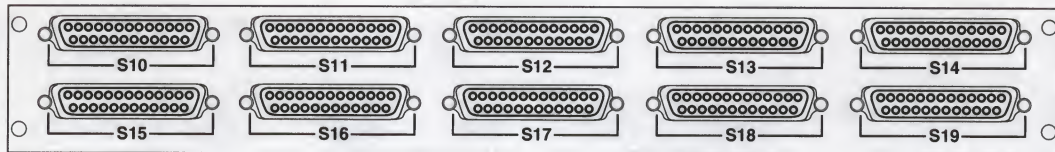
Figure 3-10 PM-2E-10I-U Base Model Rear Panel with Empty Expansion Slots



The expansion boards are shown in Figure 3-11 (MOD-2E-10A and MOD-2E-10B), Figure 3-12 (MOD-10I-U), and Figure 3-13 (MOD-10I-ST).

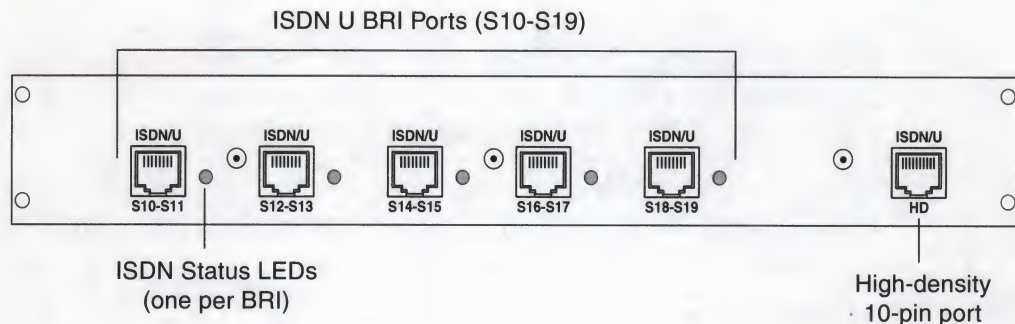
The MOD-2E-10A and MOD-2E-10B offer 10 asynchronous ports. These ports are labelled S10-S19 on the MOD-2E-10A, and S20-S29 on the MOD-2E-10B.

Figure 3-11 MOD-2E-10A Rear Panel



The MOD-10I-U offers 5 BRI U ports (10 B channels) with integrated NT1.

Figure 3-12 MOD-10I-U Expansion Board Rear Panel

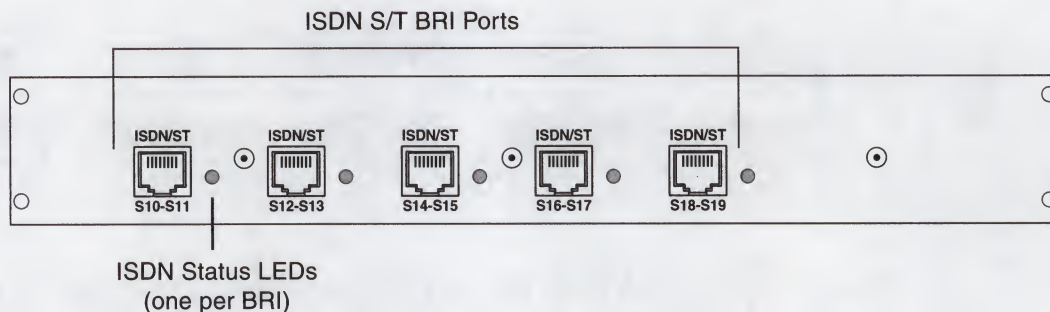


**Note** – Revisions A and B of the MOD-10I-U board may only be used in the PortMaster 2E. Revision C boards may be used in any expandable PortMaster.



The MOD-10I-ST offers 5 BRI S/T ports (10 B channels) that require external NT1.

Figure 3-13 MOD-10I-ST Rear Panel



## Power Receptacle

AC power to the PortMaster is connected using a standard power cable. The PortMaster uses an auto-sensing, auto-ranging power supply that automatically adjusts to match the input voltage. The PortMaster operates correctly at any AC voltage from 100V to 260V and frequencies from 50 to 60 Hz.



**Caution** – Before you apply power, refer to “Safety Recommendations” on page 2-1 and “Power Guidelines” on page 2-3.

To apply power:

1. Attach the power cord to the PortMaster and to a properly grounded electrical outlet.
2. Set the power switch to the ON position.

To disconnect power:

1. Set the power switch to the OFF position.
2. Detach the power cord from the outlet and the PortMaster.



## *Fuse*

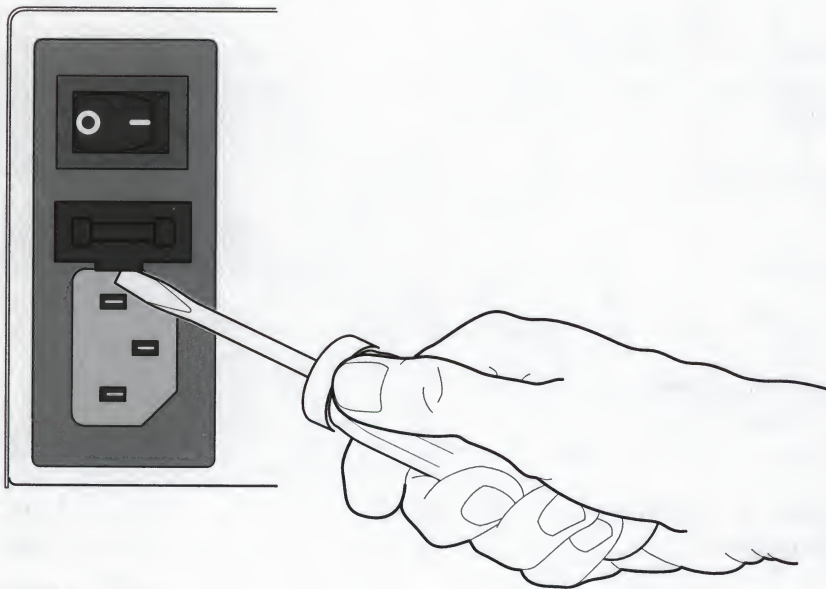
To replace the fuse:

1. Set the power switch to the OFF position.
2. Detach the power cord from the PortMaster.
3. Insert a 3/16" flathead screwdriver between the fuse door and the chassis and gently pull the fuse door open, as shown in Figure 3-14.
4. If necessary, replace the 250V, 2A fuse.

The fuse is easily removed and replaced and has no "wrong end."

5. Press the fuse door shut until it clicks.
6. Reconnect the power cord to the PortMaster.
7. Set the power switch to ON.

*Figure 3-14* Replacing the Fuse



## Five-Section DIP Switch

All PortMasters have a five-section DIP switch, shown below.

Figure 3-15 PortMaster DIP Switches

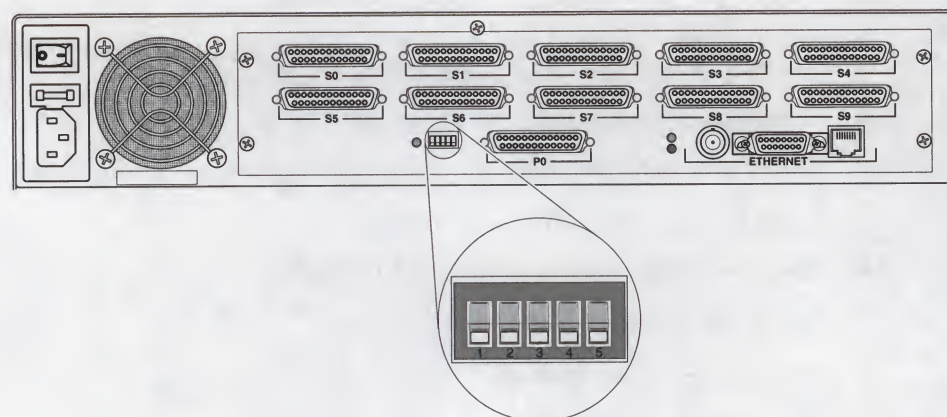


Table 3-3 DIP Switch Functionality

DIP Switch	Controls	When UP	When DOWN
1	Diagnostic mode	PortMaster boots in diagnostic mode.	PortMaster boots in normal mode.
2	Boot mode	PortMaster attempts to boot from the network using RARP and TFTP.	PortMaster boots from internal flash memory.
3	Reserved for future use. Should be left DOWN.		
4, 5	Selection of Ethernet network type		<p>If 4 and 5 are both DOWN, BNC is selected.</p> <p>If 4 is DOWN and 5 is UP, AUI is selected.</p> <p>If 4 and 5 are both UP, 10BaseT is selected.</p>

In Figure 3-15, DIP switches #4 and #5 are DOWN, selecting the BNC port for connection to the Ethernet.



**Caution** – When changing the position of the Ethernet DIP switches, power must be cycled in order for the new settings to be recognized.



**Note** – For information about the diagnostic mode, refer to “Diagnostic Boot Sequence” on page 4-4. For more information about using TFTP to boot the PortMaster, refer to the *Configuration Guide for PortMaster Products*.

## Connecting to the Network and Console

The following procedure walks you step-by-step through basic PortMaster installation.

1. **Set the power switch on the PortMaster to OFF.**
2. **Attach an RS-232 serial null modem cable to the PortMaster console port (S0 or C0) and to the serial port of a PC or terminal.**

The terminal or terminal emulator should be set for 9600 baud, 8 data bits, 1 stop bit, and no parity.

3. **Attach the power cord to the PortMaster and to a properly grounded electrical outlet.**
4. **Connect the 10BaseT, AUI, or BNC Ethernet port on the PortMaster to an Ethernet hub or transceiver using the appropriate cable. For information on setting the Ethernet DIP switches, refer to “Five-Section DIP Switch” on page 3-18.**

These are standard Ethernet cables and are not supplied with the PortMaster.



**Warning** – Before you apply power, refer to “Safety Recommendations” on page 2-1 and “Power Guidelines” on page 2-3.

5. **Set the power switch to ON.**



**6. Verify that the System LED is active.**

While the PortMaster is booting, the System LED blinks three times per second, then once per second. The LED blinks once every five seconds during normal operation.

If the System LED does not behave in this way, see "Hardware Problems and Solutions" on page 4-1.

**7. Verify that the Link LED is ON.**

The Link LED blinks once for AUI and twice for 10BaseT.

This LED is solidly lit when 10BaseT link integrity exists. When the Link LED is OFF, a 10BaseT link error has been detected. See Chapter 4, "Troubleshooting the Hardware Installation".

The Link LED is not used for the AUI or BNC connectors.

If the Link LED does not behave in the manner described above, see "Hardware Problems and Solutions" on page 4-1.

**8. Verify that the Network LED is ON when Ethernet traffic is present.**

The Network LED blinks once for every packet transmitted or received. In heavy traffic situations, the LED may appear to be solidly lit.

If the Network LED does not behave in this way, see "Hardware Problems and Solutions" on page 4-1.

**9. Once the PortMaster has booted, the console displays a login prompt:**

```
PortMaster Console login:
```

**10. Enter the address of the Ethernet interface.**

- a. If you are entering an IP address, type the following, pressing the Enter key after each line. Replace the *italicized* values with the appropriate values for your network.

```
PortMaster console login:    !root
Password: [Enter]
Command> set ether0 address 172.168.200.1
Command> save all
Command> quit
login:
```

- b. If you are entering an IPX address, type the following:

```
login:      !root
Password:   [Enter]
Command>    set ether0 ipxnet AFAF0808
Command>    set ether0 ipxframe ethernet_802.2
Command>    save all
Command>    quit
login:
```

11. If you are planning to use the command line interface to configure the PortMaster, you may do so now. If you are planning to use PMconsole to configure the PortMaster, you may now disconnect the terminal from the console port.

For command line configuration information, refer to the *Configuration Guide for PortMaster Products. An Administrator's Guide* is also available for the PMconsole for Windows interface.

## Installing PortMaster Expansion Boards



**Caution** – Do not unpack components or open the case of the PortMaster without taking measures to control static electricity, as described in “Safety Recommendations” on page 2-1.

1. Set the power switch to the OFF position and disconnect the PortMaster from the AC power source.
2. Open the PortMaster case.

Remove the screw at the center of the top rear edge, then slide the top of the PortMaster case 1/2" horizontally and lift straight up. If you encounter difficulty separating the top and bottom sections of the PortMaster case, try pressing down on the top edge sides and pushing firmly.



3. **Verify that the 60-pin ribbon has been installed in the center of the PortMaster main board.**

If the ribbon is already connected, continue to Step 4.

If it is not connected, insert the connector with the white stripe on the top into the main board, with the red line on the 60-wire ribbon closest to the power supply chamber. When inserting the 60-pin connector, support the free edge of the board (the side closest to the front of the PortMaster), with your hand so that it does not bend excessively.

4. **If installing a MOD-10I-U board, verify the board's revision number.**

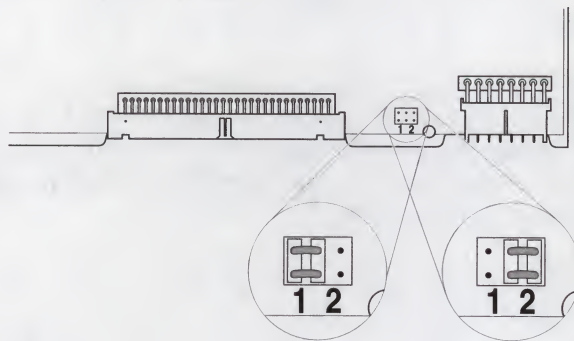
The revision number is located at the corner of the board. The PortMaster 2ER requires at least revision C of the MOD-10I-U board. Any version of the MOD-10I-U may be used in other expandable PortMasters.

5. **Verify the position of the expansion board jumper.**

The jumper is located between the two cable connectors on the expansion board.

On the MOD-2E-10A and MOD-2E-10B asynchronous expansion boards, the jumper pins are marked with two numbers, 1 and 2. If the jumper connects the pair of pins marked 1 to the middle pair of pins, the expansion board will be seen as ports S10-S19. If the jumper connects the pair of pins marked 2 to the middle pair of pins, the expansion board will be seen as ports S20-S29. See Figure 3-16.

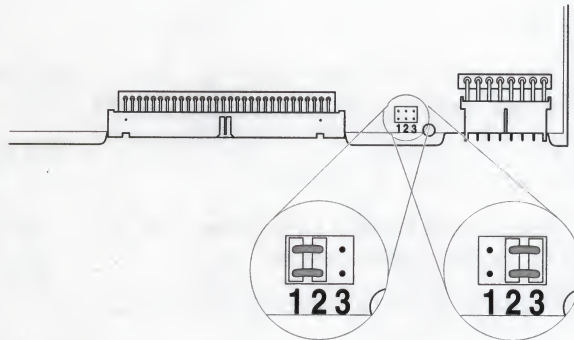
Figure 3-16 Asynchronous Expansion Board Jumpers





On the MOD-10I-U and MOD-10I-ST ISDN expansion boards, the jumper pins are marked with three numbers, 1, 2, and 3. If the jumper connects pins 1 and 2, the expansion board will be seen as ports S10-S19. If the jumper connects the pair of pins marked 2 and 3 to the middle pair of pins, the expansion board will be seen as ports S20-S29. See Figure 3-17.

*Figure 3-17 ISDN Expansion Board Jumpers*



**6. Remove the blank cover plate(s) from the rear of the PortMaster.**

The S10-S19 expansion board is inserted above the rear face plate with ports S0 through S9. The S20-S29 expansion board is inserted above the rear face plate with ports S10 through S19.

**7. Attach the rear face plates with the screws provided before attaching the data and power cables to the expansion board.**

Before tightening any of the screws, ensure that the face plate is aligned.

**8. Plug the power cable (8-wire ribbon cable) and bus cable (60-wire ribbon cable) into the front of the expansion board.**

**9. Close the PortMaster case by replacing the top of the case and the screw at the center of the top rear edge of the PortMaster.**

**10. Connect the PortMaster to the AC power source and set the power switch to the ON position.**

## Removing PortMaster Expansion Boards



**Caution** – Do not unpack components or open the case of the PortMaster without taking measures to control static electricity, as described in “Safety Recommendations” on page 2-1.

1. **Set the power switch to the OFF position and disconnect the PortMaster from the AC power source.**

2. **Open the PortMaster case.**

Remove the screw at the center of the top rear edge, then slide the top of the PortMaster case 1/2" horizontally and lift straight up. If difficulty is encountered in separating the top and bottom sections of the PortMaster case, try pressing down on the top edge sides and pushing firmly.

3. **Unplug the power cable (8-wire ribbon cable) and bus cable (60-wire ribbon cable) from the front of the expansion board.**

4. **Remove the expansion board from the rear of the PortMaster.**

The S20-S29 expansion board is located above the rear face plate with ports S10 through S19. The S10-S19 expansion board is located above the rear face plate with ports S0 through S9.

5. **Install the blank cover plate with the original screws.**

The screws, which mount the expansion face plate, should be partially screwed in and the expansion face plate aligned before tightening any of the screws.

6. **Place the expansion board into an ESD bag.**

Place the board in an ESD bag. To ship or store the bag, cushion it between foam in a sturdy box.

7. **Close the PortMaster case by replacing the top of the case and the screw at the center of the top rear edge of the PortMaster.**

8. **Connect the PortMaster to the AC power source and set the power switch to the ON position.**



## Memory Considerations

This section addresses memory use and installation.

### Base Memory Use in ComOS 3.3.1

The standard 1MB (1024K) should work for all but the most memory-intensive configurations.

In the most demanding configuration—with users being managed on a PM-2ER-20, with an ISDN expansion board, and with IPX and SNMP present—the PortMaster should be upgraded to 4MB (4096KB).

The PortMaster autodetects the installed physical memory at boot time; no jumpers must be set. 30-pin 70ns SIMMs are required. There must be 4 SIMMs; all 4 must be either 256KB, 1MB, or 4MB. The PortMaster will not function properly if a combination of SIMM sizes are installed.

To display the current memory usage and available memory, use the `show memory` command. To add memory to the PortMaster, see page 3-26.

Table 3-4 PortMaster 2E and 2ER Memory Requirements

Model	Ports			Base Memory
	Asynchronous	Synchronous	ISDN	
PM-2E-10 plus one ISDN expansion board	10	0	10	850KB
PM-2E-10 plus two ISDN expansion boards	10	0	20	900KB
PM-2E-20 plus one ISDN expansion board	20	0	10	925KB
PM-2ER-10 plus one ISDN expansion board	10	1	10	875KB



Table 3-4 PortMaster 2E and 2ER Memory Requirements (Continued)

Model	Ports			Base Memory
	Asynchronous	Synchronous	ISDN	
PM-2ER-10 plus two ISDN expansion boards	10	1	20	925K
PM-2ER-20 plus one ISDN expansion board	20	1	10	950K

The following software considerations also apply:

- When ISDN expansion boards are not used, ComOS releases 3.3 and 3.3.1 require approximately the same amount of memory as release 3.1.4. Memory is only a consideration when ISDN expansion boards are added; see Table 3-4 for details.
- If SNMP is used, an additional 50KB of memory is required. If IPX is used, an additional 20KB is required, in addition to any memory used by the IPX RIP and SAP tables.
- Memory is used to manage each table within the PortMaster. For the routing table, allow 5KB of memory for every 100 routes.

## Adding Memory

The PortMaster comes with 1 MB of RAM, which can be upgraded to 4 MB or 16 MB by replacing the four 256KB by 9 (parity) 30-pin 70ns SIMMs with either 1MB or 4MB SIMMs. Mixing SIMMs is not supported. The PortMaster will autodetect the amount of memory at boot time; no jumpers need to be changed.

To upgrade the memory, complete the steps on the following page.



**Caution** – Do not unpack components or open the case of the PortMaster without taking measures to control static electricity, as described in “Safety Recommendations” on page 2-1.

1. Set the power switch to the OFF position and disconnect the PortMaster from the AC power source.

2. Open the PortMaster case.

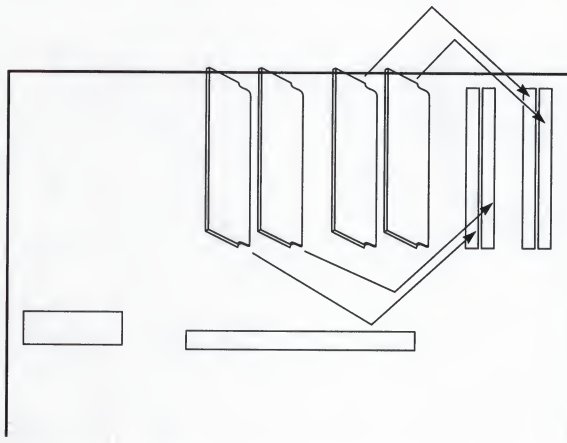
Remove the screw at the center of the top rear edge, then slide the top of the PortMaster case 1/2" horizontally and lift straight up. If the top and bottom sections of the PortMaster case are difficult to separate, try pressing down on the top edge sides and pushing firmly.

3. Tilt each SIMM gently about 30 degrees, then pull it out.

The SIMMs are located on the Main System Board in the corner furthest away from the power supply and the external connectors.

4. Insert each new SIMM at an angle, then gently push it forward until it is vertical.

*Figure 3-18 Adding SIMMs*



5. Replace the top of the PortMaster case and replace the screw at the center of the top rear edge of the PortMaster.
6. Connect the PortMaster to the AC power source and set the power switch to the ON position.





# Troubleshooting the Hardware Installation

4

This chapter gives hardware troubleshooting suggestions and discusses the diagnostic boot sequence.

## Hardware Problems and Solutions

Many hardware problems that occur during installation can be identified by checking the LEDs. Table 4-1 identifies LED behavior, possible causes of the behavior, and potential solutions. To contact Livingston Technical Support, refer to page xi in the Preface for contact information.

Table 4-1 Hardware Problems and Solutions

LED Behavior	Possible Cause	Solution
System LED does not light.	Lack of power.	Check the power switch, power cable, outlet, and fuse.
During power-on, the System LED fails to light, becomes solidly lit, or continues to blink three times per second.	Hardware problem.	Contact Livingston Technical Support.
During power-on, the System LED continues blinking once per second for more than a minute.	DIP switch #2 UP and no boot server present.	If there is not a boot server available, verify that DIP switch #2 is in the down position and reboot; otherwise, see the "Network Booting" procedure in the <i>Configuration Guide for PortMaster Products</i> .
	Flash RAM contents corrupt.	Follow the <i>Configuration Guide for PortMaster Products</i> procedure for "Network Booting" and rewriting the contents of Flash RAM.

Table 4-1 Hardware Problems and Solutions (Continued)

LED Behavior	Possible Cause	Solution
Immediately after booting, the System LED remains solidly ON or completely OFF. (Note: This does not refer to the boot sequence, when the System LED goes OFF for 5-7 seconds.)	A component may have loosened during shipping.	<p>Open the PortMaster using anti-static precautions (see page 3-21). Verify that:</p> <ol style="list-style-type: none"> <li>1) All four SIMMS are firmly seated</li> <li>2) The PROM is firmly in place</li> <li>3) The Ethernet card is firmly in place and standoff screws are tight</li> <li>4) The expansion board jumpers are correct</li> <li>5) The data cable is firmly seated</li> </ol> <p>If all items have been verified and the problem is not fixed, refer to "Diagnostic Boot Sequence" on page 4-4 and boot in diagnostic mode. If the displayed diagnostics do not suggest a solution, record the information and contact Livingston Technical Support.</p>
After booting, an ISDN S/T status LED turns off. (ISDN S/T units only)	The BRI is not able to synchronize with the attached NT1.	Check to ensure that the correct directory numbers have been assigned to each port of the BRI. Ensure that the cable connecting the BRI and the NT1 is securely attached. If the problem persists, contact your service provider.
After booting, an ISDN U status LED blinks once per second or turns off. (ISDN U units only)	No SPID is set on the port.	Verify that the correct SPID has been assigned to the port and that the correct switch type is set. See the "ISDN Connections" <i>Configuration Guide for PortMaster Products</i> for the appropriate commands.
	There is no circuit to the telephone company.	Verify that the BRI cable is securely attached. If this doesn't solve the problem, contact your service provider.



Table 4-1 Hardware Problems and Solutions (Continued)

LED Behavior	Possible Cause	Solution
During operation, the System LED remains solidly ON or completely OFF.	Hardware failure (possibly caused by an external device).	If the LED is still solidly lit or completely OFF after removing all external devices (except the diagnostics terminal), contact Livingston Technical Support.
No console login prompt.	Incorrect terminal settings, bad connection, or bad cable.	Verify that the console cable is plugged into S0, not S5. Verify terminal settings of 9600, 8N1. Verify that DIP switch #1 is UP. Verify that you have a working null modem cable and that it is properly connected at both ends. See Appendix A, "Cabling Specifications."
Link LED is OFF.	If you are connected to an AUI or BNC Ethernet transceiver, this is not a problem.	
	If you are connected to a 10BaseT Ethernet hub, you do not have link integrity.	Verify that both DIP switches #4 and #5 are UP (for 10BaseT), that you have a working 10BaseT cable, and that it is properly connected at the PortMaster and at the hub. Cycle power to activate the DIP switch setting.
Network LED is ON.	If traffic is heavy, this may only be an illusion.	
	If no packets are being passed, you may have an incorrectly cabled network.	Verify that the network cabling is correct.



Table 4-1 Hardware Problems and Solutions (Continued)

LED Behavior	Possible Cause	Solution
Network LED is solid OFF.	If there is no traffic, this is normal.  If packets cannot be passed, you may have an incorrectly cabled network.	Verify that the network cabling is correct.
Undefined difficulty with booting and you are not able to isolate the problem by observing LED behavior.	Not determined.	See "Diagnostic Boot Sequence" on page 4-4 and boot in diagnostic mode. If the displayed diagnostics do not suggest a solution, record the information and contact Livingston Technical Support.

## Diagnostic Boot Sequence

If you are having difficulty booting the PortMaster and are unable to isolate the problem by observing LED behavior, you may wish to boot in diagnostic mode.

To boot the PortMaster in diagnostic mode, complete the following instructions:

1. Set the power switch on the PortMaster to the OFF position.
2. Set the terminal to 9600 baud, 8 data bits, no parity, 1 stop bit, and software flow control (XON/XOFF).
3. Set DIP switch #1 to the UP position.
4. Attach the terminal to the console port (S0) using a null modem cable. Refer to Table A-1 on page A-1 for cable pinouts.



**Caution** – Before you reapply power, refer to "Safety Recommendations" on page 2-1 and "Power Guidelines" on page 2-3.

5. Set the power switch to the ON position.

**6. Observe the diagnostic boot messages displayed on the console screen.**

These messages may vary slightly, depending on the version of the PROM and whether or not expansion boards are installed. The boot messages in Figure 4-1 apply to a PM-2E-10I-U without any expansion boards.

*Figure 4-1 PortMaster Diagnostic Boot Messages*

```
Testing Low Memory....
Testing System Clock....
Testing System Memory.... 1024K
Checking Boot Rom....
Calibrating.... 33MHz
Starting FLASH Boot.....
Booting From Flash Type AM29F040
Loading Image at 0fff0000
17082 flash copy complete
Verifying Load Module Checksum...
Starting Load Module...
Loading kernel...586988 bytes
Testing High Memory... . 1024K
ISDN found in slot 1 - Testing memory.. 512K
Found 11 ports....
ether0 active... 64K burst-IO
Running ComOS...
```

```
PortMaster Console login:
```

Table 4-2 Interpreting the Diagnostic Boot Messages

Field	Possible Message	Explanation
Boot Prom Rev	G	Version number of the installed boot prom.
Testing Low Memory	ERROR	Error indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Testing System Clock	ERROR	Error indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Testing System Memory	ERROR at <i>failed memory address</i>	Error indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Checking Boot Rom	ERROR	Error indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Calibrating	33MHz	Processor speed.
Starting FLASH Boot	N/A	N/A
Booting from FLASH type	AM29F040	Flash brand name.
Loading Image at	0fff0000	RAM address.
flash copy complete	17082	Counter for Flash bytes transferred to RAM. If the counter freezes, record all information to this point and contact Livingston Technical Support.
Verifying Load Module Checksum	Invalid Length for Flash at <i>RAM address</i>	Error indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Starting Load Module	N/A	N/A



Table 4-2 Interpreting the Diagnostic Boot Messages (Continued)

Field	Possible Message	Explanation
Loading Kernel	506000	Size of kernel image in bytes.
Testing High Memory	ERROR at <i>failed memory address</i>	Error indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Async found in slot ISDN found in slot Testing memory	512K	ISDN or asynchronous interface found. Test of memory in progress.
Found x Ports	11, 21, 25, 31	Number of ports found, including C0, P0, or W1.
ether0 active	64K burst - IO	Ethernet interface found.
Running ComOS	N/A	If system hangs at this point and does not print the next message, the configuration flash memory has been corrupted. Refer to the "Troubleshooting" chapter of the <i>Configuration Guide for PortMaster Products</i> .
PortMaster Console login:	N/A	System up and running.



# Cabling Specifications

## A

This appendix provides pinouts for the PortMaster console (asynchronous null-modem serial) cable, asynchronous straight-through serial cable, high-density 68-pin asynchronous serial cable, synchronous (RS-232, V.35, X.21 and RS-530) serial cables, ISDN RJ-45 cables (U and S/T interfaces), and the high-density 10-pin ISDN cable. Ethernet cabling specifications are also provided.

### Null Modem Cable

Ports S0-S29 are asynchronous DTE ports with female RS-232 connectors. To connect to a terminal or other DTE, use a null modem cable, typically male-to-female, as shown in Table A-1. Directions (input/output) are with respect to the PortMaster. The PortMaster does not use DSR.



**Note** – When the console port is connected to a terminal, it uses software flow control and therefore only requires pins 2, 3, and 7.

Null modem cables may be obtained from most suppliers of computer equipment.

Table A-1 Null Modem Cable

Pins (Port)	Name	Definition	Direction	Pins (Terminal)
2	TXD	Transmit Data	Output	3
3	RXD	Receive Data	Input	2
4	RTS	Request to Send	Output	5
5	CTS	Clear to Send	Input	4
6,8	DCD	Data Carrier Detect	Input	20
7	GND	Ground		7
20	DTR	Data Terminal Ready	Output	6,8



## ***Straight-through Cable***

Ports S0-S29 are asynchronous DTE ports with female RS-232 connectors. To connect to a modem or other DCE, use a male-to-male straight-through cable, as shown in Table A-2. Directions (input/output) are with respect to the PortMaster.

This cable is not supplied, but can be ordered from Livingston Enterprises by specifying product code MC-6.

*Table A-2*    Straight-Through Cable

<b>Pins (Port)</b>	<b>Name</b>	<b>Definition</b>	<b>Direction</b>	<b>Pins (Modem)</b>
2	TXD	Transmit Data	Output	2
3	RXD	Receive Data	Input	3
4	RTS	Request to Send	Output	4
5	CTS	Clear to Send	Input	5
6	DSR	Data Set Ready	Not used	6
7	SGND	Signal Ground		7
8	DCD	Data Carrier Detect	Input	8
20	DTR	Data Terminal Ready	Output	20

All PortMaster products support an external modem connected to the S0 port (C0 on ISDN models) or any asynchronous port.

Livingston recommends any major vendor of V.32bis or V.34 modems. For best results, the modem should be configured to do the following:

- Lock DTE rate at 115.2k or as high as the modem can operate reliably
- Raise DCD when it senses carrier (usually &C1)
- Reset modem when DTR is dropped (usually &D3, sometimes &D2)
- Use hardware flow control (RTS/CTS)
- Set s0=1 for dial-in (answers the phone on the first ring)

## High-Density 68-pin Connector

The PM-25 has three high-density 68-pin connectors. Two types of cables can be ordered from Livingston Enterprises for use with the high-density ports on the PM-25:

- A 4 foot (120 cm) long cable that splits into eight DB-25 straight-through cables for use with separate modems. To order this cable from Livingston Enterprises, specify product code DC-8DB.
- A 3 foot (90 cm) long cable that splits into two 50-pin high-density connectors for use with a US Robotics quad modem rack. To order this cable from Livingston Enterprises, specify product code DC-HDM.

Table A-3 High-Density 68-pin to Eight DB-25 Cable

Port	Signal	Definition	68-pin Number	25-pin Connector	DSub (male) Pin Number
1	RTS	Request to Send	2	1	4
	DTR	Data Terminal Ready	36	1	20
	TXD	Transmit Data	3	1	2
	SGND	Signal Ground	37	1	7
	DSR	Data Set Ready	4	1	6
	RXD	Receive Data	38	1	3
	DCD	Data Carrier Detect	5	1	8
	CTS	Clear to Send	39	1	5
2	RTS	Request to Send	6	2	4
	DTR	Data Terminal Ready	40	2	20
	TXD	Transmit Data	7	2	2
	SGND	Signal Ground	41	2	7
	DSR	Data Set Ready	8	2	6
	RXD	Receive Data	42	2	3
	DCD	Data Carrier Detect	9	2	8
	CTS	Clear to Send	43	2	5

Table A-3 High-Density 68-pin to Eight DB-25 Cable (Continued)

Port	Signal	Definition	68-pin Number	25-pin Connector	DSub (male) Pin Number
3	RTS	Request to Send	10	3	4
	DTR	Data Terminal Ready	44	3	20
	TXD	Transmit Data	11	3	2
	SGND	Signal Ground	45	3	7
	DSR	Data Set Ready	12	3	6
	RXD	Receive Data	46	3	3
	DCD	Data Carrier Detect	13	3	8
	CTS	Clear to Send	47	3	5
4	RTS	Request to Send	14	4	4
	DTR	Data Terminal Ready	48	4	20
	TXD	Transmit Data	15	4	2
	SGND	Signal Ground	49	4	7
	DSR	Data Set Ready	16	4	6
	RXD	Receive Data	50	4	3
	DCD	Data Carrier Detect	17	4	8
	CTS	Clear to Send	51	4	5
5	RTS	Request to Send	18	5	4
	DTR	Data Terminal Ready	52	5	20
	TXD	Transmit Data	19	5	2
	SGND	Signal Ground	53	5	7
	DSR	Data Set Ready	20	5	6
	RXD	Receive Data	54	5	3
	DCD	Data Carrier Detect	21	5	8
	CTS	Clear to Send	55	5	5



Table A-3 High-Density 68-pin to Eight DB-25 Cable (Continued)

Port	Signal	Definition	68-pin Number	25-pin Connector	DSub (male) Pin Number
6	RTS	Request to Send	22	6	4
	DTR	Data Terminal Ready	56	6	20
	TXD	Transmit Data	23	6	2
	SGND	Signal Ground	57	6	7
	DSR	Data Set Ready	24	6	6
	RXD	Receive Data	58	6	3
	DCD	Data Carrier Detect	25	6	8
	CTS	Clear to Send	59	6	5
7	RTS	Request to Send	26	7	4
	DTR	Data Terminal Ready	60	7	20
	TXD	Transmit Data	27	7	2
	SGND	Signal Ground	61	7	7
	DSR	Data Set Ready	28	7	6
	RXD	Receive Data	62	7	3
	DCD	Data Carrier Detect	29	7	8
	CTS	Clear to Send	63	7	5
8	RTS	Request to Send	30	8	4
	DTR	Data Terminal Ready	64	8	20
	TXD	Transmit Data	31	8	2
	SGND	Signal Ground	65	8	7
	DSR	Data Set Ready	32	8	6
	RXD	Receive Data	66	8	3
	DCD	Data Carrier Detect	33	8	8
	CTS	Clear to Send	67	8	5

## Synchronous Port to RS-232 Connector

Table A-4 describes the pinouts for the PortMaster DTE synchronous RS-232 serial port connector (W1). The directions (input/output) are with respect to the PortMaster. Pins not listed have no connection. To connect to this port, you can use a straight-through 25-pin RS-232 cable.

RS-232 only supports signalling at speeds up to 56Kbps. If the connected device supports RS-423 signalling, speeds up to 128Kbps can be obtained.

This cable is not supplied, but can be ordered from Livingston Enterprises by specifying product code MC-6.

*Table A-4* Synchronous Serial with RS-232 Cable

Pin	Name	Definition	Direction
2	TXD	Transmit Data	Output
3	RXD	Receive Data	Input
4	RTS	Request to Send	Output
5	CTS	Clear to Send	Input
6	DSR	Data Set Ready	Input
7	SGND	Signal Ground	
8	DCD	Data Carrier Detect	Input
15	ST	Send Timing	Input
17	RT	Receive Timing	Input
20	DTR	Data Terminal Ready	Output

## Synchronous Port to V.35 Connector

Table A-5 describes the pinouts for the PortMaster DTE synchronous V.35 serial port connector (W1), capable of speeds up to T1 (1.544Mbps) or E1 (2.048Mbps). The directions (input/output) are with respect to the PortMaster. Pins not listed have no connection.

This cable is supplied with the PM-25. Additional cables can be ordered from Livingston Enterprises by specifying product code DC-6.

*Table A-5* Synchronous Serial with V.35 Cable

Pin	Name	V.35 Pin	Definition	Direction
2	TXD	P	Transmit Data	Output
14	TXD-	S		
3	RXD	R	Receive Data	Input
16	RXD-	T		
4	RTS	C	Request to Send	Output
5	CTS	D	Clear to Send	Input
6	DSR	E	Data Set Ready	Input
7	SGND	B	Signal Ground	
8	DCD	F	Data Carrier Detect	Input
15	ST	Y	Send Timing	Input
13	ST-	AA		
17	RT	V	Receive Timing	Input
19	RT-	X		
20	DTR	H	Data Terminal Ready	Output



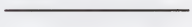
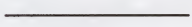
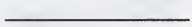

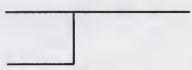
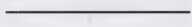
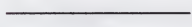


## Synchronous Port to DB-15 X.21 Connector

Table A-6 describes the pinouts for the synchronous serial port to DB-15 X.21 connector (W1) cable, capable of speeds up to T1/E1. The directions (input/output) are with respect to the PortMaster. Pins not listed have no connection.

This cable is not supplied, but can be ordered from Livingston Enterprises by specifying product code CBL-X21-6.

Table A-6 Synchronous Serial X.21 Cable

PortMaster Port W1	V.35 DB-25 Pin	Name	Definition	Connections	X.21 DB-15 Pin	Name
7	B	SGND	Signal Ground		8	SGND
4	C	RTS	Request to Send		3	Control A
5	D	CTS	Clear to Send			
8	F	CD	Carrier Detect		5	Indicate A
3	R	RXA	Receive Data		4	RXA
16	T	RXB	Receive Data		11	RXB
17	V	RX CLKA	Receive Timing		6	CLKA
15	Y	TX CLKA	Send Timing			
19	X	RX CLKB	Receive Timing		13	CLKB
13	AA	TX CLKB	Send Timing			
2	P	TXD A	Transmit Data		2	TXA
14	S	TXD B	Transmit Data		9	TXA

## Synchronous Port to RS-530 Connector

Table A-7 provides the pinouts for the synchronous serial port to DB-25 RS-530 cable, capable of speeds up to T1/E1. The directions (input/output) are with respect to the PortMaster. Pins not listed have no connection.

This cable is not supplied, but can be ordered from Livingston Enterprises by specifying product code CBL-530-6.

Table A-7 Synchronous Serial RS-530 Cable

PortMaster Port W1	RS-530 CSU/DSU	Name	Definition	Direction
2	2	TXD	Transmit Data	Output
14	14	TXD-		
3	3	RXD	Receive Data	Input
16	16	RXD-		
4	4	RTS	Request to Send	Output
5	5	CTS	Clear to Send	Input
6	6	DSR	Data Set Ready	Input
7	7	SGND	Signal Ground	
8	8	DCD	Data Carrier Detect	Input
15	15	ST	Send Timing	Input
13	12	ST-		
17	17	RT	Receive Timing	Input
19	9	RT-		
20	20	DTR	Data Terminal Ready	Output

## ***ISDN/ST BRI Port to RJ-45 Connector***

Table A-8 provides the pinout for the ISDN/ST port. The directions (input/output) are with respect to the PortMaster. To connect to this port, use an RJ-45 to RJ-45 cable. Five cables are shipped with each PortMaster S/T unit; one cable for each BRI.

*Table A-8* ISDN/ST Port to RJ-45 Connector

<b>RJ-45 Pin</b>	<b>Name</b>	<b>Definition</b>	<b>Direction</b>
3	TXD	Transmit Data	Output
6	TXD-		
4	RXD	Receive Data	Input
5	RXD-		

## ***ISDN/U BRI Port to RJ-45 Connector***

Table A-9 provides the pinout for the ISDN/U port. The directions (input/output) are with respect to the PortMaster.

This cable is not supplied, but can be ordered from Livingston Enterprises by specifying product code CBL-4545 (RJ-45 to RJ-45) or CBL-1145 (RJ-45 to RJ-11).

*Table A-9* ISDN/U to RJ-45 Connector

<b>ISDN/U Port</b>	<b>Direction</b>
4	Input/Output
5	Input/Output



## High-Density 10-pin ISDN cable

Table A-10 describes the pinouts for the 20 foot (6 m) high-density 10-pin ISDN cable. The cable is unshielded 24 gauge solid level 1 wiring. When using this port, the LEDs next to the five BRI ports indicate the status of each BRI that is connected through the HD port.

This cable is supplied with the MOD-10I-U, PM-2i-U, and PM-2E-10I-U. Additional cables can be ordered from Livingston Enterprises by specifying product code CBL-HD45. Punchdown blocks are available from electronic supply stores that carry telephone equipment.

Table A-10 High-Density 10-pin RJ-45 Cable

Pin	Color	Ports S0-9	Ports S10-19	Ports S20-29
1	white-gray	5	S18-19	S28-29
2	white-brown	4	S16-17	S26-27
3	white-green	3	S14-15	S24-25
4	white-orange	2	S12-13	S22-23
5	white-blue	1	S10-11	S20-21
6	blue-white	1	S10-11	S20-21
7	orange-white	2	S12-13	S22-23
8	green-white	3	S14-15	S24-25
9	brown-white	4	S16-17	S26-27
10	gray-white	5	S18-19	S28-29

Your cable may have 2 extra lines that are solid red or solid blue. Disregard these lines; they are not used.



**Caution** – Do not insert an 8-pin RJ-45 cable into the high-density 10-pin port, as damage to the pins in the port may result.

## Ethernet Interface

Specifications for the 10Mbps Baseband IEEE 802.3-compatible Ethernet interface are provided in Table A-11.

Table A-11 Network Interface Cabling

Ethernet Type	Connector Type	Cable Type	Transmission Distance
AUI	15-pin DIX for connection to external transceiver	RG-11 50 $\Omega$ coaxial	Trunk segment - 1,640 ft/500 m max Transceiver cable - 164 ft/50 m max Network trunk - 8,200 ft/2,500 m max
BNC	BNC T-Connector	RG-58 A/U 50 $\Omega$ coaxial	Trunk segment - 984 ft/300 m max Station distance - 1.5 ft/0.5 m max Network trunk - 3,035 ft/925 m max
RJ-45	RJ-45 for 10BaseT	Unshielded Twisted Pair	Hub distance - 328 ft/100 m max Repeaters - 4 max

To obtain a product list and prices for optional Ethernet accessories available from Livingston, contact the dealer from which you purchased your PortMaster.

# Physical Specifications

B

This appendix describes the interface, physical, environmental and electrical specifications for PortMaster Communications Servers.

## Interface Specifications

Table B-1 Interface Specifications

Interface	Description	2	2E	2ER	2R	25	2i	2E-IOI
Ethernet	10BaseT (RJ-45), AUI (DB-15), or BNC	1	1	1	1	1	1	1
Asynchronous Serial	RS-232/423, with data rates up to 115,200 bps	10	10, 20 or 30	10, 20 or 30	10	25*	1	1
Synchronous Serial	RS-232, V.35, RS-530, or X.21; capable of up to T1/E1 speeds	-	-	1	1	-	-	-
Parallel	Centronics-compatible parallel device	1	1	-	-	-	-	-
ISDN U	RJ-45 BRI with integrated NT1 (U interface), each providing two 64Kbps B channels and one 16Kbps D channel.	-	0, 5 or 10	0, 5 or 10	-	-	5	5, 10, or 15
ISDN S/T	RJ-45 BRI with ISDN S/T interface, providing two 64Kbps B channels and one 16Kbps D channel.	-	0, 5 or 10	0, 5 or 10	-	-	5	5, 10, or 15

\* One RS-232/423 (console) port and three high-density 68-pin connectors, each supporting eight RS-232/423 asynchronous serial devices



## Physical Specifications

Table B-2 Physical Specifications

Description	PM-2, PM-2R, PM-25, PM-2i	PM-2E, PM-2ER, PM-2E-10I
Dimensions (HxWxD)	3.2" x 16.8" x 11.5" (8.1cm x 42.7cm x 29.2cm)	6.5" x 16.8" x 11.5" (16.5cm x 42.7cm x 29.2cm)
Weight	12.2 lb. (5.5 kg)	18.5 lb. (8.4 kg)

## Environmental and Electrical Specifications

Table B-3 Environmental and Electrical Specifications

Description	Design Specifications
Operating temperature	41 to 113°F (5 to 45°C)
Storage temperature	-40 to 185°F (-40 to 85°C)
Operating humidity	20 to 80%, noncondensing
Input Voltage	110 VAC +/-10%, 47 to 63 Hz, 1.0A 220 VAC +/-10%, 47 to 63 Hz, 0.6A
Power Dissipation	20-40 Watts
Memory	512KB NVRAM, 1MB RAM expandable to 4MB or 16MB

# Ordering ISDN Service

---

C

This appendix applies only to PortMaster users installing ISDN U interface models in the USA and Canada.

Call your local telephone service provider to find out about ISDN service availability, pricing, and features. Typically there is an ISDN installation cost, a monthly flat-rate service cost, and usage costs.

For a list of ISDN providers in the USA and Canada see page C-3.

## Ordering Instructions

Your telephone service provider may inquire about your ISDN interface. Read the following information to the sales person:

"I have an ISDN device with a BRI (Basic Rate Interface) port which provides two B channels for data and one D channel for signalling. The BRI port has an integrated NT1, providing a U interface."

To order ISDN service, complete the following steps.

1. **Ask your service provider what the costs are for CSV/CSD (Circuit-Switched Voice/Circuit-Switched Data) and for CSD (Circuit-Switched Data) and select the less expensive service.**

PortMaster ISDN models can be used for data transmission only. However, many ISDN providers offer both data and voice service over ISDN at less cost than data only, and the PortMaster can use channels configured that way for transmitting data.

If ordering voice and data is less expensive than data only, have both ISDN B channels configured for CSV/CSD, even though the PortMaster transmits only data over the line. If data is less expensive than voice and data service, have the two ISDN B channels configured for CSD. The PortMaster works with either configuration.

Ask your service provider:

"Does it cost more to configure my ISDN line for both voice and data than it does for just data?"

If the answer is no, tell the service provider:

"Provision both ISDN B channels for voice and data and the D channel for call signalling."

If the answer is yes (voice and data costs more than just data) tell the service provider:

"Provision both ISDN B channels for data only and the D channel for call signalling."

**2. Be ready to provide switch type translations.**

Ask your provider:

"What ISDN switch type will I be connected to?"

Based on the answer, FAX or read them the appropriate one-page table from this chapter:

If the response is	FAX (or read) from
"National ISDN-1" or "NI-1 compliant"	Table C-2
"AT&T 5ESS Custom Multi-Point"	Table C-3
"AT&T 5ESS Custom Point-to-Point"	Table C-4
"Northern Telecom DMS-100 Custom" or "DMS-100"	Table C-5



**3. Choose a service provider for long-distance ISDN service.**

It may be easiest to stay with the same telephone company that provides your existing analog long-distance service, though this is not a requirement.

**4. Configure your site wiring to support ISDN service.**

Ask your provider what additional wiring is necessary to support ISDN on your premises.

Depending on your existing wiring, you may need to have an extra pair of copper wires brought to your premises or additional inside wiring installed.

If your ISDN wall jack is an RJ-11 jack (four pins, like a standard telephone jack), use an RJ-11 to RJ-45 cable. If it is an RJ-45 jack (8 pins), use an RJ-45 to RJ-45 cable.

**5. Get your Switch Type, SPIDs and Directory Numbers.**

You need this information to configure the PortMaster.

The SPID (Service Profile Identifier) identifies your equipment to the ISDN switch. Directory Numbers are the telephone numbers assigned to your ISDN B channels by the Telephone Company.

To configure the ISDN Switch Type, SPID, and/or port directory numbers on the PortMaster, see the "ISDN Connections" chapter of the *Configuration Guide for PortMaster Products*.

## ISDN Providers

Table C-1 provides a list of ISDN providers in the USA and Canada.

Table C-1 ISDN Providers

Contact Information	State
<b>Ameritech</b> <b>1-800-TEAMDATA</b>	Illinois, Indiana, Michigan, Ohio
<b>Bell Atlantic</b> <b>1-800-570-ISDN</b>	Delaware, Maryland, New Jersey, Pennsylvania, Virginia, Washington DC, West Virginia
<b>Bell South</b> <b>1-800-428-ISDN</b>	Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee

Contact Information	State
<b>Cincinnati Bell</b> 513-566-DATA	Ohio, Kentucky
<b>Nevada Bell</b> 702-688-7124	Nevada
<b>NYNEX</b> 1-800-GET-ISDN 617-743-1333	Massachusetts, Maine, New Hampshire, New York (except Rochester), Rhode Island, and Vermont
<b>Pacific Bell</b> 1-800-472-ISDN	California
<b>Rochester Telephone</b> 716-777-1234	Rochester, NY area
<b>Southern New England Telephone</b> 1-800-430-ISDN	Connecticut
<b>Southwestern Bell</b> 1-800-SWB-ISDN	Arkansas, Kansas, Missouri, Oklahoma, Texas
<b>US West</b> 1-800-358-4513	Arizona, Colorado, Idaho, Iowa, Minnesota, Montana, N. Dakota, Nebraska, New Mexico, Oregon, S. Dakota, Utah, Washington, Wyoming
<b>AGT 403-530-7100</b>	Alberta
<b>BC TEL 604-432-5529</b>	British Columbia
<b>Bell Canada</b> 1-800-334-4736 514-870-4636	Ontario Quebec
<b>MT&amp;T - Island Tel</b> 902-487-4723	Nova Scotia - PEI
<b>MTS 204-941-8784</b>	Manitoba
<b>NBTel 506-658-7980</b>	New Brunswick
<b>Newfoundland Tel</b> 709-739-2023	Newfoundland
<b>SaskTel 306-777-5454</b>	Saskatchewan

Table C-2 National ISDN-1 (NI-1) Switch Translations

Attribute	Parameters
Line	2B+D
Line Code	2B1Q
Terminal Type	A
MAX B Channels	2
B1	CSD (or CSVD)
B2	CSD (or CSVD)
D	signalling
CSD	2
CSD CHANNEL	any
CSD LIMIT	2
ACT USR	Yes
Dynamic TEI	Yes
EKTS	No
MTERM	1
CA PREF	1
Call Appearances	Idle
Protocol Version Control	2
Release Key	No
Ringing Indicator	No



Table C-3 5ESS Custom Multi-Point Switch Translations

Attribute	Parameters
Line	2B+D
Line Code	2B1Q
Terminal Type	A
MAX B Channels	2
B1	CSD (or CSVD)
B2	CSD (or CSVD)
D	signalling
CSD	2
CSD CHANNEL	any
ACT USR	Yes
Dynamic TEI	Yes
EKTS	No
MTERM	1
CA PREF	1
Autohold	No
OneTouch	No
Display	No
Call Appearances	Idle

Table C-4 5ESS Custom Point-to-Point Switch Translation

Attribute	Parameter
Terminal Type	A
Call Appearances	1
Display	No
Channels for CSV per DN	1
Channels for CSD per DN	1

Table C-5 DMS-100 Custom Switch Translations

Attribute	Parameter
Line	2B+D
Line Code	2B1Q
Terminal Type	A
MAX B Channels	2
Circuit Switched Service	Yes
CSD/CSV Channel	Any
Signalling	Functional
Dynamic TEI	Yes
EKTS	No
Protocol Version Control	1
Max # Programmable Keys	3
Release Key	No
Ringing Indicator	No





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